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## PROVISIONAL SPECIFICATION

## Improvements relating to Hockey Sticks

We, DUNLOP RUBBER COMPANY LIMITED, a British Company, of 1, Albany Street, London, N.W.1, and GEORGE VAUGHAN and HARRY PETERS, both British Subjects, of the aforesaid Company's Works at Waltham Abbey, Essex, do hereby state the nature of this invention to be as follows:—

This invention relates to hockey sticks 10 and in particular to the shafts of hockey sticks.

It is desirable that a hockey stick shaft should be light and flexible but sufficiently rigid to withstand torsion without 15 appreciable twisting.

An object of this invention is to provide a shaft in which these desiderata are attained.

According to the invention a shaft for 20 a hockey stick comprises a centre portion formed with opposite parallel faces and extending longitudinally of said shaft and being of a lightweight wood of such a thickness as to offer high torsional resistance, and one or more composite layers 25 comprising a lamina of rubber and a lamina of wood secured to the said faces so that the rubber and wood are alternately arranged, said wood laminae being 30 of such a wood as to offer high resistance to the stresses due to bending of the shaft in a direction normal to the plane of the laminae.

Preferably the centre portion is made 35 of willow in solid or laminated formation and the wood laminae are made of ash or hickory.

A form of a hockey stick shaft will now 40 be described as built up and before being shaped to the desired size and form for gripping purposes.

A wood centre portion made of willow is of a length convenient for the size of 45 a hockey stick and in cross-section is of rectangular shape, being approximately  $\frac{7}{16}$  of an inch thick by  $1\frac{1}{16}$  inches wide. Adhesively secured to each of the two faces of the centre portion is a lamina of soft rubber, equal in width to the width 50 of the centre portion and  $\frac{1}{16}$  of an inch

thick. Adhesively secured to the outer face of each rubber lamina is a wood lamina made of ash or alternatively hickory and being  $\frac{1}{8}$  of an inch thick and equal in width to the width of the centre portion.

In another form of hockey stick shaft the centre portion is made of willow of solid or laminated formation and is of a length convenient for the size of hockey 60 stick. The centre portion is rectangular in cross-sectional shape being  $\frac{5}{16}$  of an inch thick by  $1\frac{1}{16}$  inches wide. Adhesively secured to each of the two faces of the centre portion is a lamina of soft rubber which is  $\frac{1}{32}$  of an inch thick and adhesively secured to the outer face of each rubber lamina is a wood lamina made of ash and being  $\frac{3}{32}$  inches thick. Adhesively secured to the outer face of each wood lamina is a soft rubber lamina which is  $\frac{1}{32}$  of an inch thick and adhesively secured to the outer face of each of said rubber lamina is a wood lamina made of ash and being  $\frac{1}{8}$  of an inch thick. The 75 rubber and wood laminae are all equal in width to the width of the centre portion.

In each form of shaft described, that end of the shaft which is to be spliced to the head has a tapered portion which extends for a length of approximately 7 inches, the flanks of said tapered portion being disposed at right angles to the planes of the laminae. Adjacent the wide end of the tapered portion the rubber laminae are terminated and for the length of said tapered portion a lamina of ash or alternatively hickory replaces each of said rubber laminae. The butt joints formed between the rubber and ash or hickory laminae are arranged on the bias and adjacent joints are of different hands.

At the handle end of either of the previously described forms of shaft a rubber lamina is adhesively secured to each of the two outer faces thereof. The rubber laminae are equal in width to the width of the centre portion, are  $\frac{1}{16}$  of an inch thick, and extend for a distance of approximately 9 inches from the end of 100

[Price 2/-]

6 said shaft. To the outer face of each of said rubber lamina is adhesively secured a wood lamina of obechi, which is a light-weight wood, each of said wood laminae being equal in width and length to the said rubber laminae and being  $\frac{3}{16}$  of an inch thick.

10 The shaft is afterwards shaped to a circular cross-section at the end of the handle and merging into an oval cross-section further along the shaft.

15 A shaft constructed as described is spliced to the hockey stick head with the planes of the laminae of said shaft parallel to the plane of the striking face of said head.

20 The shaft is closely bound with tape in the region of the splice for a length corresponding to the length of said splice, and the binding is continued almost to the end

of the handle in spiral form, the pitch of the spiral gradually increasing towards the handle so that the strengthening effect of the binding decreases gradually from the splice.

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It should be appreciated that the centre portion, being made of willow, which is a comparatively lightweight and weak wood has a cross-section which is sufficiently large to counteract the twisting forces imposed thereon. The ash or hickory laminae, being comparatively stronger woods, counteract the bending forces imposed on the shaft, said bending forces being in a direction normal to the striking face of the head and also to the planes of the laminae.

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85 Dated this 2nd day of June, 1948.

R. F. MCKAY,  
Acting for the Applicants.

#### COMPLETE SPECIFICATION

#### Improvements relating to Hockey Sticks

We, DUNLOP RUBBER COMPANY LIMITED, a British Company, of 1, Albany Street, 40 London, N.W.1, and GEORGE VAUGHAN and HARRY PETERS, both British Subjects, of the aforesaid Company's Works at Waltham Abbey, Essex, do hereby declare the nature of this invention and 45 in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to hockey sticks 50 and in particular to the shafts of hockey sticks.

It is desirable that a hockey stick shaft should be light and flexible but sufficiently rigid to withstand torsion without 55 appreciable twisting.

An object of this invention is to provide a shaft having these properties.

According to the invention a shaft for a 60 hockey stick comprises a centre portion of willow extending longitudinally of said shaft and being formed with opposite parallel faces and of such thickness as to offer high torsional resistance, and one or more composite layers comprising a 65 lamina of rubber and a lamina of birch, ash or hickory secured to the said faces so that the rubber and said wood laminae are alternately arranged.

Willow, from which the centre portion 70 of the shaft is formed, is a comparatively lightweight and weak wood and said centre portion has a cross-section which is sufficiently large to counteract the twisting forces imposed thereon due to the 75 hockey stick striking a hockey ball. The birch, ash or hickory laminae are comparatively stronger woods and are of suitable cross-section to counteract the bending forces imposed on the shaft due to the

hockey stick striking a hockey ball, said bending forces being in a direction normal to the striking face of the head of said stick and also to the planes of the laminae. These conditions may be satisfied by having a willow centre portion of the order of  $\frac{3}{8}$  thickness, and by the total thickness of the birch, ash or hickory laminae being of the order of  $\frac{3}{16}$ . Said willow centre portion may be of solid or laminated formation.

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A hockey stick shaft will now be described, as built up and before being shaped to the desired size and form for gripping purposes, with reference to the accompanying drawings in which:—

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Figure 1 is an elevation of a hockey stick shaft showing the various laminae;

Figure 2 is a plan view of Figure 1;

Figure 3 is a section on the line 3—3 of Figure 1 prior to the shaping of the shaft to the required contour;

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Figure 4 is a section on the line 4—4 of Figure 1 prior to the shaping of the shaft to the required contour;

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Figure 5 is a section on the line 4—4 of Figure 1 showing an alternative construction;

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Figure 6 is an exploded view on an enlarged scale of a portion of the shaft adjacent the splice.

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Referring to Figures 1 and 3 a wood centre portion 1 made of willow is of a length convenient for the size of hockey stick and in cross-section is of rectangular shape, being approximately  $\frac{7}{16}$  of an inch thick by  $1\frac{1}{16}$  inches wide. Adhesively secured to each of the two faces of the centre portion is a lamina of soft rubber 2 equal in width to the width of the centre portion and  $\frac{1}{16}$  of an inch thick. 115 Adhesively secured to the outer face of

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each rubber lamina is a wood lamina 3 made of birch or alternatively of ash or hickory and being  $\frac{1}{8}$  of an inch thick and equal in width to the width of the centre portion.

As shown in Fig. 2 that end of the shaft which is to be spliced to the head of the hockey stick has a tapered portion 6 which extends for a length of approximately

10 7 inches, the flanks of said tapered portion being disposed at right angles to the planes of the laminae. Adjacent the wide end of the tapered portion the rubber laminae are terminated and for the 15 length of said tapered portion a lamina 7 of birch or alternatively ash or hickory replaces each of said rubber laminae as shown in Figure 6. Bevelled joints 8 are formed between the rubber and birch 20 laminae and adjacent joints are of different hands.

At the handle end of the shaft a rubber lamina 4 is adhesively secured to each of the two outer faces thereof. The rubber 25 laminae are equal in width to the width of the centre portion, are  $\frac{1}{16}$  of an inch thick, and extend for a distance of approximately 9 inches from the end of said shaft. To the outer face of each of 30 said rubber lamina is adhesively secured a wood lamina 5 of obeche, which is a lightweight wood, each of said wood laminae being equal in width and length to the said rubber laminae and being  $\frac{3}{8}$  of 35 an inch thick.

The shaft is afterwards shaped to a circular cross-section, as shown by the broken line 9, Fig. 3, at the handle end and merging into an oval cross-section as 40 shown by the broken line 10 Fig. 4 further along the shaft.

A shaft constructed as described is spliced to the hockey stick head with the planes of the laminae of said shaft parallel 45 to the plane of the striking face of said head.

The shaft is closely bound with tape in the region of the splice for a length corresponding to the length of said splice, 50 and the binding is continued almost to the end of the handle in spiral form, the pitch of the spiral gradually increasing towards the handle so that the strengthening effect of the binding decreases 55 gradually from the splice.

In another form of hockey stick shaft, shown in Figure 5, the centre portion 1 is

made of willow of solid or laminated formation and is of a length convenient for the size of hockey stick. The said centre 60 portion is rectangular in cross-sectional shape being  $\frac{5}{16}$  of an inch thick by  $1\frac{11}{16}$  inches wide. Adhesively secured to each of the two faces of the centre portion is a lamina of soft rubber 2 which is  $\frac{1}{32}$  of an 65 inch thick and adhesively secured to the outer face of each rubber lamina is a wood lamina 3 made of birch and being  $\frac{3}{32}$  inches thick. Adhesively secured to the outer face of each wood lamina is a soft rubber lamina 2 which is  $\frac{1}{32}$  of an inch thick and adhesively secured to the outer face of each of said rubber lamina is a wood lamina 3 made of birch and being  $\frac{1}{8}$  of an inch thick. The rubber and wood laminae are all equal in width to the width of the centre portion prior to being shaped to the desired contour.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. A shaft for a hockey stick comprising a centre portion of willow extending longitudinally of said shaft being formed with opposite parallel faces and of such thickness as to offer high torsional resistance and one or more composite layers comprising a lamina of rubber and a lamina of birch, ash or hickory secured to the said faces so that the rubber and said wood laminae are alternately arranged.

2. A shaft for a hockey stick according to claim 1 wherein the willow centre portion is approximately  $\frac{3}{8}$ " thick and the total thickness of the birch, ash or hickory laminae is approximately  $\frac{3}{8}$ ".

3. A shaft for a hockey stick according to claim 1 or claim 2 wherein the handle portion of said shaft has a lamina of rubber secured to each of the aforesaid outer wood laminae and a lamina of obeche secured to each of said rubber laminae.

4. A shaft for a hockey stick constructed substantially as described herein with reference to the accompanying drawings.

5. A hockey stick having a shaft in accordance with any of the preceding claims.

Dated this 26th day of May, 1949.

R. F. MCKAY,  
Acting for the Applicants.

## British

5-14

by Dunlap

2 SHEETS  
SHEET 1

**637,779 COMPLETE SPECIFICATION**

Hockey shaft

[This Drawing is a reproduction of the Original on a reduced scale.]

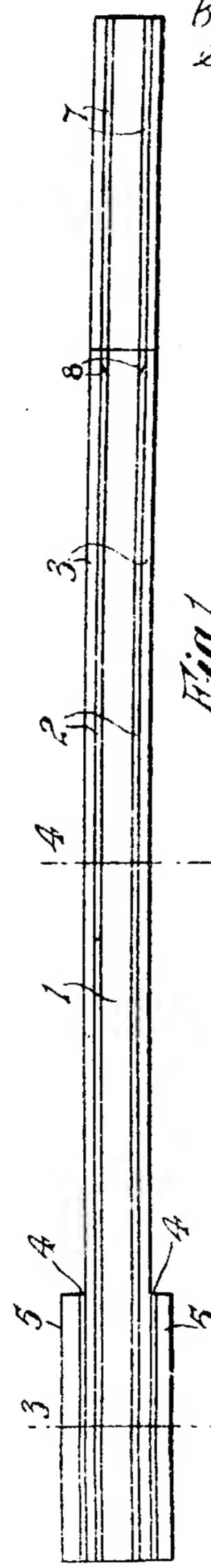


Fig. 1.



Fig. 2.

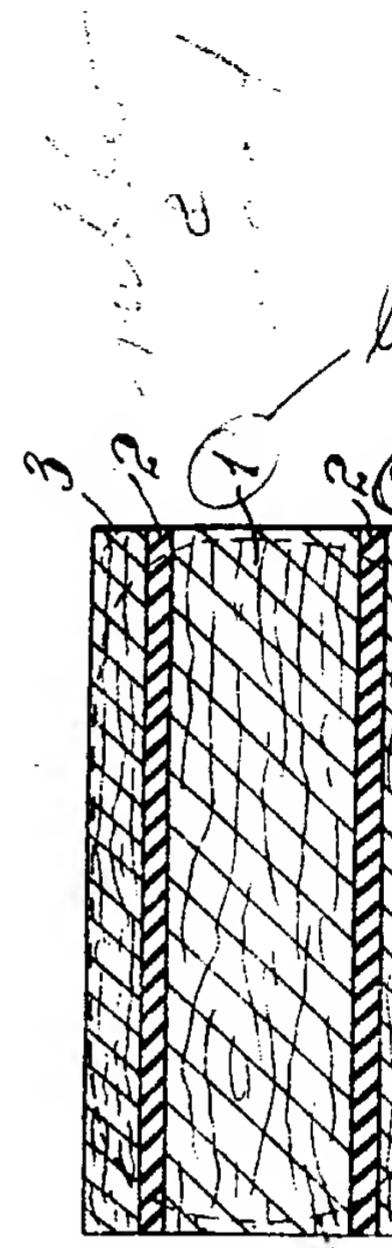


Fig. A.

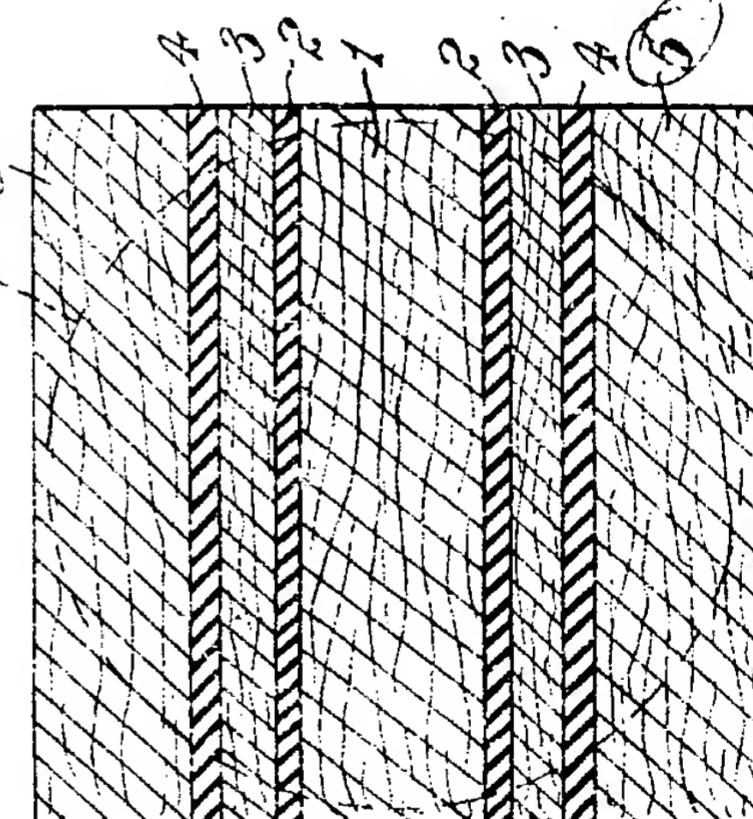


Fig. 3.

H.M.S.O. (Ty. B)

*[This Drawing is a reproduction of the Original on a reduced scale.]*

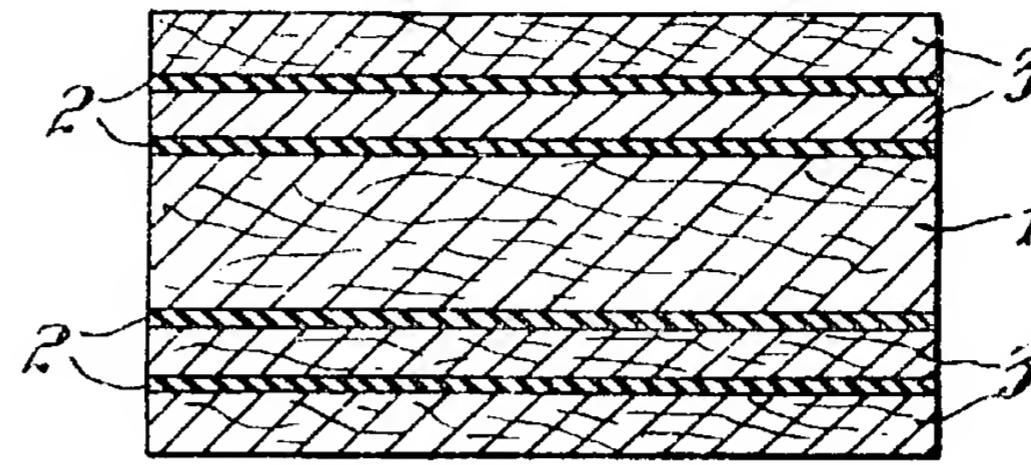


Fig. 5.

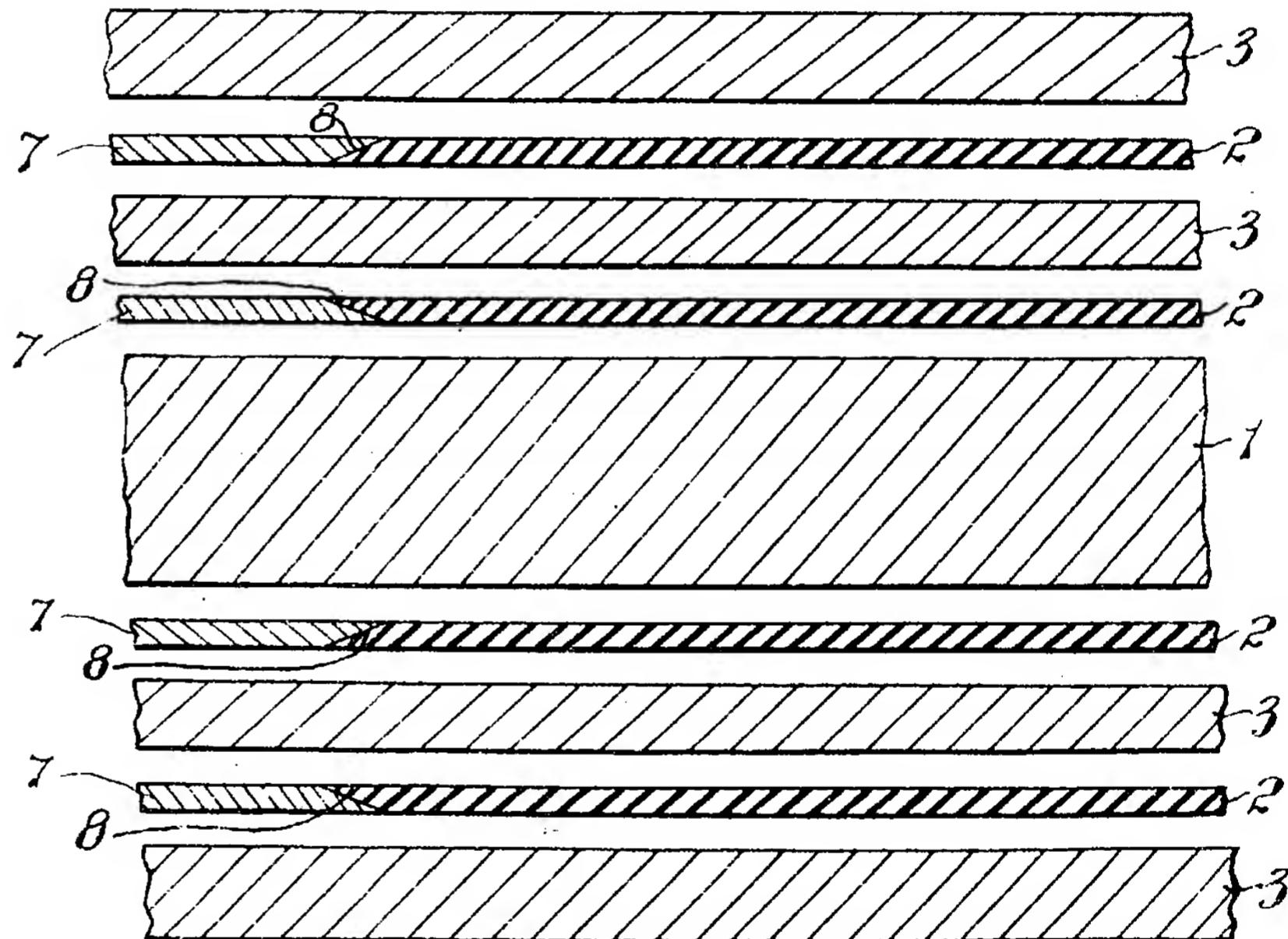


Fig. 6.